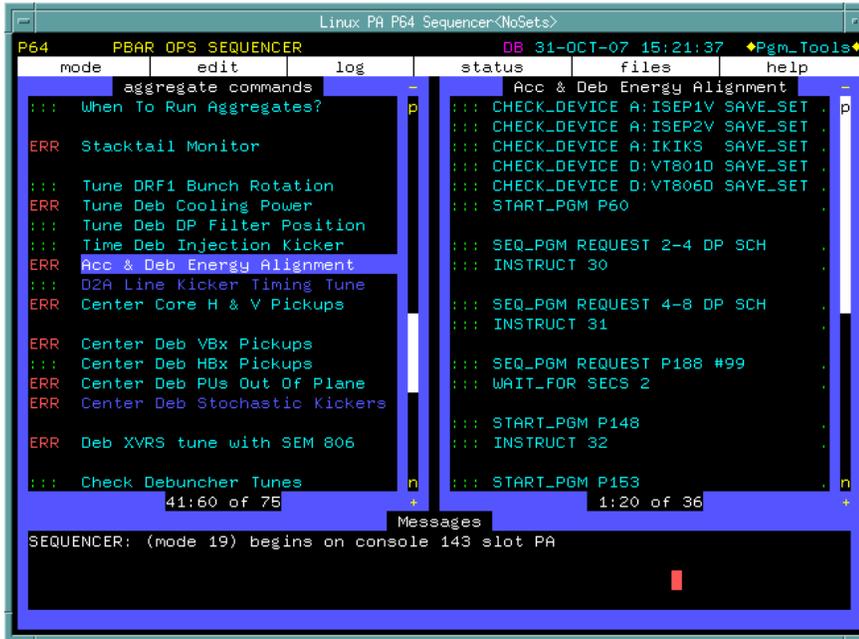
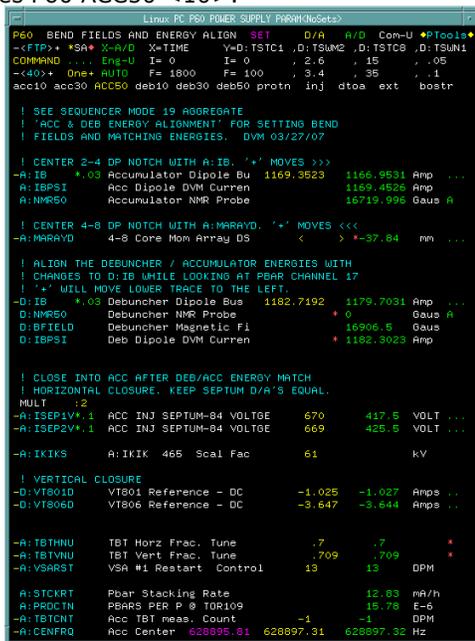


Accumulator/Debuncher Energy Alignment:

- This tuning procedure can be completed by using the "Acc & Deb Energy Alignment" aggregate in the Pbar Ops Sequencer.



- The sequencer first saves the values of the Accumulator closure devices, and then launches P60 ACC50 <10>:



- Step #1: Set A:IB.**
 - The Sequencer then connects 2-4GHz core momentum SCH signal to Spectrum Analyzer #1.

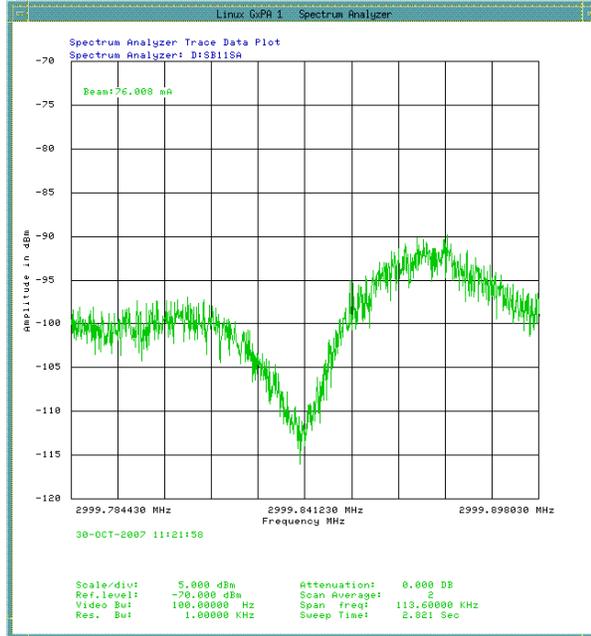
Analyzer #1.

```

Look at Pbar channel 20. The notch in the SA trace should be
located exactly on the center line. If it is not, make small
changes to A:IB until it is. The '+' key will move the notch
to the right.

Interrupt Anywhere In This Box When The Notch Is Centered
    
```

-
- Look at CATV channel 20. The display will be asymmetrical if we are stacking due to beam in the stacktail. The display will be symmetrical if we are not stacking.



Pasted from <<http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=pbar07&action=view&page=-4247&button=yes&invert=yes>>

- The object is to move A:IB until the notch is lined up with the center trace on the plot.

```

! SEE SEQUENCER MODE 19 AGGREGATE
! 'ACC & DEB ENERGY ALIGNMENT' FOR SETTING BEND
! FIELDS AND MATCHING ENERGIES. DVM 03/27/07

! CENTER 2-4 DP NOTCH WITH A:IB. '+' MOVES >>>
-A:IB   *.03 Accumulator Dipole Bu  1169.3523  1166.9531 Amp ...
A:IBPSI Acc Dipole DVM Curren      1169.4514  1169.4514 Amp
A:NMR50 Accumulator NMR Probe      16719.97   Gaus A
    
```

○ **Step 2: Align the 4-8 GHz Momentum notch:**

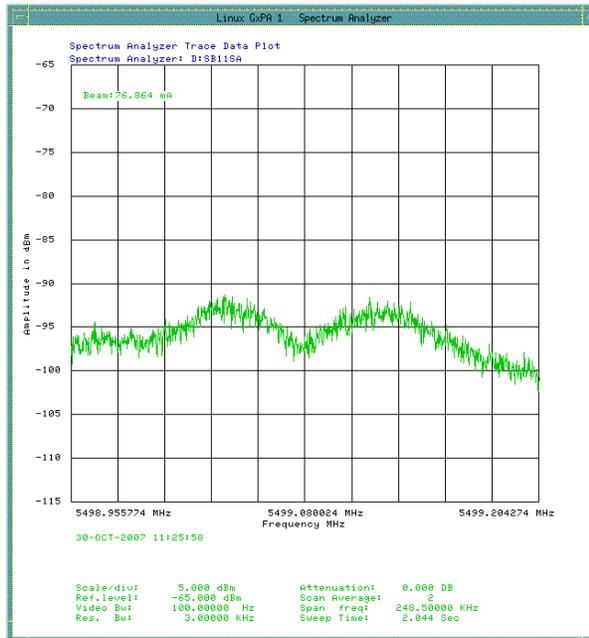
- The sequencer next connects the Accumulator 4-8GHz Momentum SCH signal to spectrum analyzer #1.

```

Look at Pbar channel 20. The notch in the SA trace should be
located exactly on the center line. To center this SA trace,
move the 4-8 momentum array with A:MARAYD, not A:IB. The '+'
key will move the notch to the left.

Interrupt Anywhere In This Box When The Notch Is Centered
    
```

-
- Look at CATV Channel 20



Pasted from <<http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=pbar07&action=view&page=-4248&button=yes&invert=yes>>

- The object is to align the 4-8GHz Momentum array with A:MARAYD. A "+" knob moves the notch to the left.

```

| CENTER 4-8 DP NOTCH WITH A:MARAYD. '+' MOVES <<<
-A:MARAYD      4-8 Core Mom Array DS      <   > *-37.84 mm ...

```

○ **Step 3: Set D:IB**

- Next, the Sequencer loads the Debuncher bunch rotation display to Spectrum Analyzer #1 to put it back to it's default display.
- The sequencer next sets up the D/A FFT VSA from P148.

```

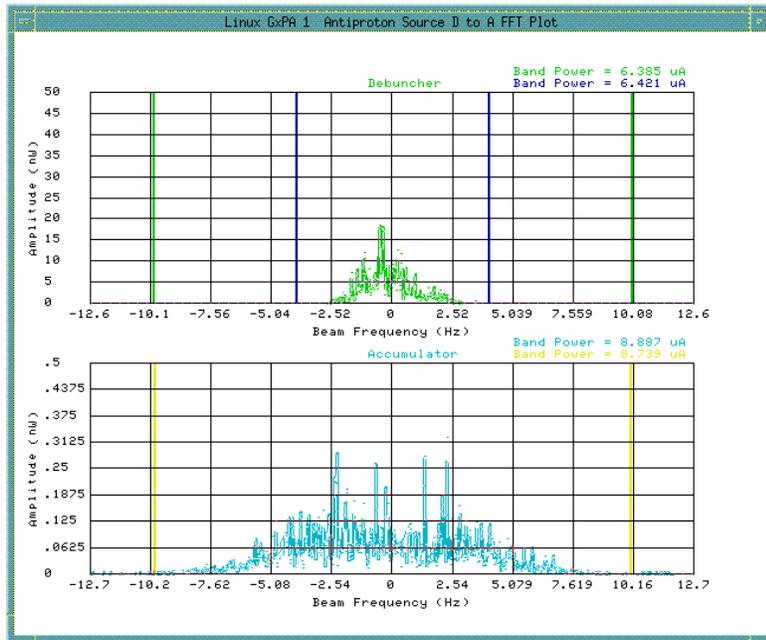
Now look at Pbar channel 17. If there are not two traces
roughly right over each other, select 'Setup VSA' on P148,
scroll down to 'Stacking Operatinal File' in the file
menu, and interrupt on it. Then interrupt in the lower right
corner (outside all the windows) to download the file to
the VSA.

The top trace is the Debuncher, the bottom trace is the
Accumulator. If the two traces are not vertically lined up,
change D:IB by small amounts until they do. The '+' button
(raising D:IB current) will move the bottom trace to the
left.

Interrupt Anywhere In This Box When The Traces Are Aligned

```

- View CATV Channel 17.
- For a better view, from P148, click the "Run FFT" tab and select "Cont Trace." This will launch the FFT VSA SA.



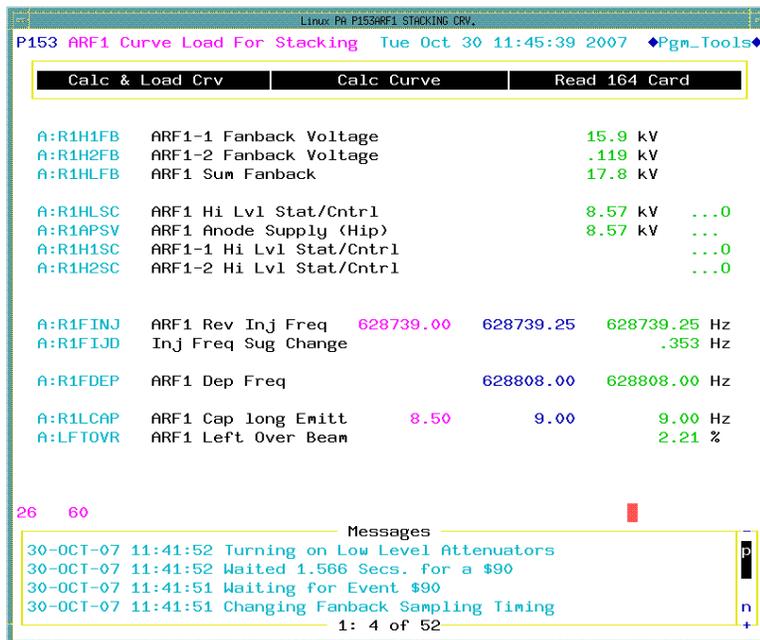
Pasted from <<http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=pbar07&action=view&page=-4249&button=yes&invert=yes>>

- The object is to change D:IB to align the two traces. The "+" knob will move the lower trace to the left. The top trace is the Accumulator and the bottom trace is the Debuncher.

```
! ALIGN THE DEBUNCHER / ACCUMULATOR ENERGIES WITH
! CHANGES TO D:IB WHILE LOOKING AT PBAR CHANNEL 17
! '+' WILL MOVE LOWER TRACE TO THE LEFT.
-D:IB * .03 Debuncher Dipole Bus 1182.7192 1179.7031 Amp ...
D:NMR50 Debuncher NMR Probe * 0 Gauss A
D:BFIELD Debuncher Magnetic Fi 16906.61 Gauss
D:IBPSI Deb Dipole DVM Curren * 1182.3021 Amp
```

○ **Step 5: Set ARF1**

- The sequencer next launches P153. This is a single user program.



Pasted from <<http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=pbar07&action=view&page=-4251&button=yes&invert=yes>>

- The object is to

- Change the injection frequency A:R1FINJ to compensate for the bend bus changes that we just made. The parameter A:R1FIJD will give us an approximate indication of the required change.
- Change the ARF1 longitudinal emittance parameter A:R1LCAP to adjust the ARF1 fanback amplitude A:R1HLFB to keep the beam left over on the Accumulator injection orbit under control
 - ◆ A:R1HLFB should be between 17 and 20 KV
 - ◆ A:LFTOVR should be between 3.0% and 7.0%

```

When the machine energy alignment is done, you will need to
check that ARF1's pickup frequency (A:R1FINJ) is matched to
the injected beam on the Accumulator injection orbit from
P153.

Generally, A:R1FIJD is a good estimate as to how much you
will need to change A:R1FINJ. Change A:R1FINJ by the amount
recommended and then interrupt on 'Calc & Load Crv'.

When the curve is loaded, wait 10 or so cycles to go by so
the VSA can average a few times. With normal intensity on
target

- A:R1HLFB should be between 17 & 20 KV.
- A:LFTOVR should be between 3.0% & 7.0%

If the voltage is correct but A:LFTOVR is high, check the
Debuncher cooling after you finish this aggregate.

If A:LFTOVR is too low, reduce ARF1 voltage (A:R1LCAP).

Interrupt Anywhere In This Box When ARF1 Check Is Done

```

- Sometimes I assist by starting a 15Hz once+ plot with A:IBMINJ, A:LFTOVR, A:STACKRT and A:PRDCTN (no screen capture). LFTOVR and IBMINJ take a while to adjust.

○ **Step 6: Accumulator Closure**

```

◆◆◆◆◆ !! TBT WARNING !! ◆◆◆◆◆
◆
◆ Before starting the Accumulator TBT, wait for a stable
◆ stacking rate. The TBT program can hurt the stackrate
◆ so you will need to compare the stacking rate before and
◆ after closure is done.
◆
◆ If the rate is worse after closure is done, restore the
◆ closure device settings on P60 and make a note in the
◆ Pbar log. This can be a serious problem and Pbar people
◆ need to know!
◆
◆ If P60 was closed and you lost the restore values, they
◆ can be recovered by running the 'CHECK_DEVICE' commands
◆ at the bottom of this aggregate.
◆
◆ Never kill P155 while it is running EXCEPT by using the
◆ 'Abort' button in the center of the page. If you leave
◆ the page any other way, the DRF1 adiabatic ramp will not
◆ be restored and stacking will not recover!
◆
◆ Interrupt Anywhere In This Box When You Have Recorded
◆ The 'Before TBT' Stacking Rate
◆
◆◆◆◆◆

```

- The Sequencer next starts the P155 pledge pin (Accumulator closure) application. Running the pledge pin in continuous mode makes for a significant hit on stacking, so make sure to exit the application when you are done.

hit on stacking, so make sure to exit the application when you are done.

```

Last thing to do is check Accumulator injection closure (changing
the Debuncher bend field can change horizontal closure in the
Accumulator).

The Pbar Pledge Pin (P155 - Accumulator TBT - I didn't name it)
is running on this console. Interrupt on 'Cont Measure' to start
the TBT measurement.

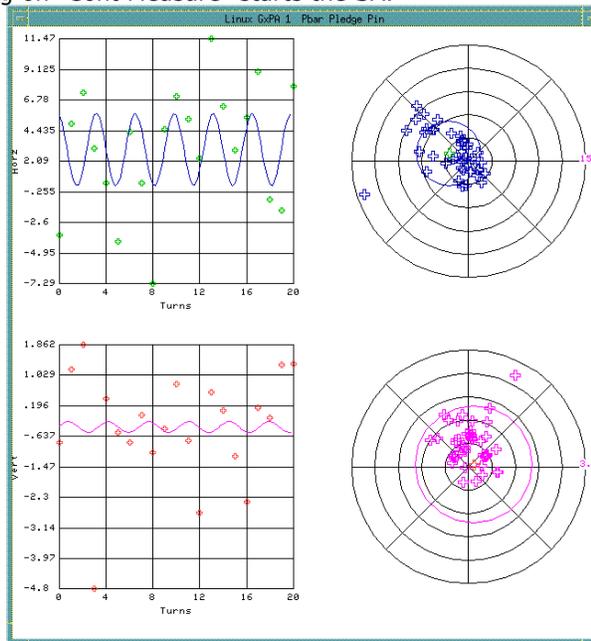
This measurement will really kill the stackrate, so be sure to
hit the 'Abort' button in the center of P155 as soon as closure
is done.

On P60, adjust the A:ISEP mult and A:IKIK to close horizontally.
Use D:VT801D & D:VT806D to close vertically.

Interrupt Anywhere In This Box When Acc TBT Is Done

```

- Clicking on "Cont Measure" starts the SA.



Pasted from <<http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=pbar07&action=view&page=-4255&button=yes&invert=yes>>

- The object is to center the beam horizontally and vertically in the bullseye plot using the A:ISEP*V mult and A:IKIKS horizontally, and D:VT801D and D:VT802D vertically.

```

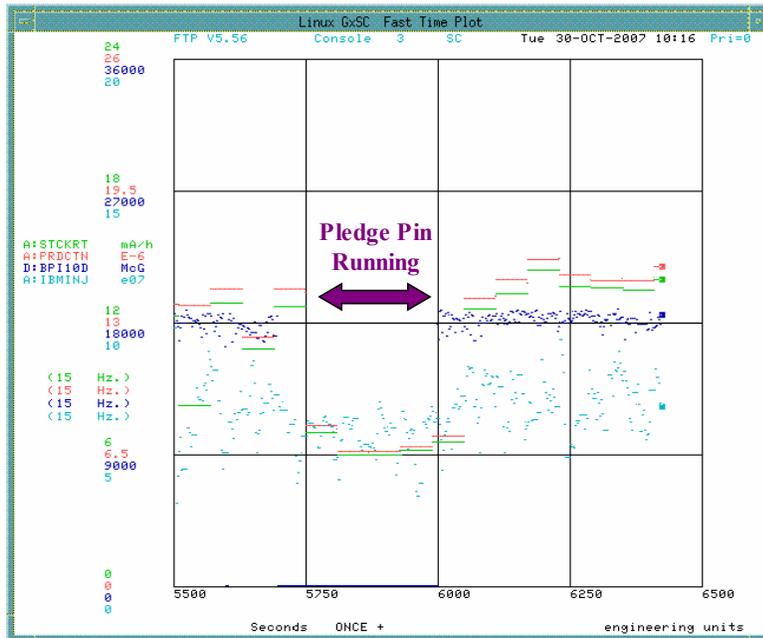
! CLOSE INTO ACC AFTER DEB/ACC ENERGY MATCH
! HORIZONTAL CLOSURE. KEEP SEPTUM D/A'S EQUAL.
MULT      : 2
-A: ISEP1V*.1  ACC INJ SEPTUM-84 VOLTGE      670      418.5  VOLT ...
-A: ISEP2V*.1  ACC INJ SEPTUM-84 VOLTGE      669      428    VOLT ...

-A: IKIKS      A: IKIK  465  Scal Fac      61          kV

! VERTICAL CLOSURE
-D: VT801D     VT801 Reference - DC          -1.025  -1.028  Amps ..
-D: VT806D     VT806 Reference - DC          -3.647  -3.645  Amps ..

```

- Wait to see the if you did any good. I usually have a FTP running with production and stackrate.



- In the above plot, we can see when the pledge pin was run. We can also see that stacking was marginally better after our tuning, so we will leave the changes in place.

```

After finishing the TBT, wait here for 5 minutes or until
the stacking rate stabilizes. If the stacking rate is the
same or better than before the TBT, then you are done and
you should CANCEL when leaving this INSTRUCT.

If the rate went down after the TBT was done, restore the
device settings from P60 or run the five 'CHECK_DEVICE'
commands that follow this INSTRUCT.

Please put any changes you made in the Pbar logbook along
with the TBT polar plot.

Interrupt Anywhere In This Box When Copies Are Done

```

- The sequencer has a built in mechanism to revert out of the pledge pin changes. If you continue on and execute the last lines of the aggregate, then the accumulator closure parameters will be restored to the values saved when running the first few lines of the aggregate.